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[Formerly PRIMITIVE MAN]

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CONTENTS

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ANNOUNCEMENT OF CHANGE OF TITLE

Starting with Volume 26, No. 1, January, 1953, the title of PRIMITIVE MAN, the quarterly periodical of the Catholic Anthropological Conference, has been changed to ANTHROPOLOGICAL QUARTERLY.

During the last few years there have been a number of indications that the original title is no longer altogether a satisfactory one. It is felt that the new name ANTHROPOLOGICAL QUARTERLY indicates more accurately the scope of the journal and that the change is best made upon the completion of twenty-five volumes under the former title.

THE EDITORS

HUMAN EVOLUTION—1956

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It is very natural for human beings to be curious about the history of things they observe in the world. From childhood on, we are always asking "Why?" and "How did it get that way?" It is supremely natural for human beings to ask such questions about what interests them most—themselves.

There are many sciences dealing with various aspects of Man, but one—Anthropology—has taken Man as Man for its field. Anthropology regards Man as a legitimate object of scientific examination. It attempts to develop what I may call the natural history of Man. This is a good phrase in two senses, because the history of a thing is an important element in its understanding, and the word "natural" here means scientific. In this paper, I propose to summarize what Anthropology, as a science, can answer to the question: "How did Man get that way?"

In the first part of this paper, I shall give a continuous version of what I think Man's actual history was, in those long days before he began to write his history. This is the story as I see it now, speaking as an anthropologist. There will be items in this story to be changed, years from now, when we know more; there are items which would be challenged by other anthropologists; but this is the best I can do in the present state of our knowledge.

In the second part, I want to emphasize the reasonableness of the methods used in putting together such a story and the nature of the evidence upon which the story is based. The history

of Man's body will be the main theme; but it would be impossible to do justice to that history, without including other elements of the total history of Man.

In an appendix, we shall discuss the Evolution of Man in its relation to Catholic Theology.

I. The History of Ancient Man[1]

Sometime between 600,000 and 1,000,000 years ago, the world experienced a number of interesting (if not always pleasant) changes. In some parts, the earth's crust was being folded into new mountains; in others, volcanoes exploded with unusual frequency. But the changes we know best occurred in the north, and made their effects felt all over the world: it was the beginning of the Ice Age.

Large amounts of ice began to form in the north, and in mountain regions, such as the Alps. The northern ice covered Eurasia and North America—almost all of Ireland and England, and northern Germany, and thence up into Siberia, in Eurasia; Canada, and some of our northern States, in North America.

This ice formed a tremendous mass. The size of the last (and not the greatest) of the four great glaciations has been estimated at five million *cubic miles* of ice!

That last sentence implies two important factors that should be remembered about the Ice Age, and its bearing on Man's history: (1) Each glaciation was so massive that its effects were registered all over the world; (2) The ice was not static, but expanded and receded several times.

[1] Recent more or less popular books which may be generally recommended are: Senet, André. 1956. Man in Search of His Ancestors. New York, McGraw-Hill; Coon, Carleton S. 1954. The Story of Man. New York, Alfred Knopf; Murray, Raymond W. 1948. Man's Unknown Ancestors. Milwaukee, Bruce; Broderick, Alan H. 1948. Early Man. London, Hutchinson's Scientific and Technical Publ.; Howells, William. 1945. Mankind So Far. New York, Doubleday, Doran; Hooton, Earnest A. 1946. Up from the Ape. 2nd ed. New York, Macmillan. Good papers on both the scientific and theological aspects of evolution are contained in: Bivort de la Saudée, Jacques de (Ed.). 1953. God, Man and the Universe. New York, Kenedy.

Ice and Early Human History—Four times the ice advanced, and four times it retreated. This series of advances and retreats forms the basis for our *chronology* of early Man's history, as can be seem from the chart (Fig. 1, around which this paper is organized). More importantly, the changes induced by the ice-masses were an intimate part of Man's own history. Early Man was infinitely more in close contact with his environment than modern urban people. Hunting animals, gathering eggs and insects, grubbing for roots, picking fruits and berries—these were his methods of obtaining food. The materials for his houses and for his clothing and for the religious symbols he

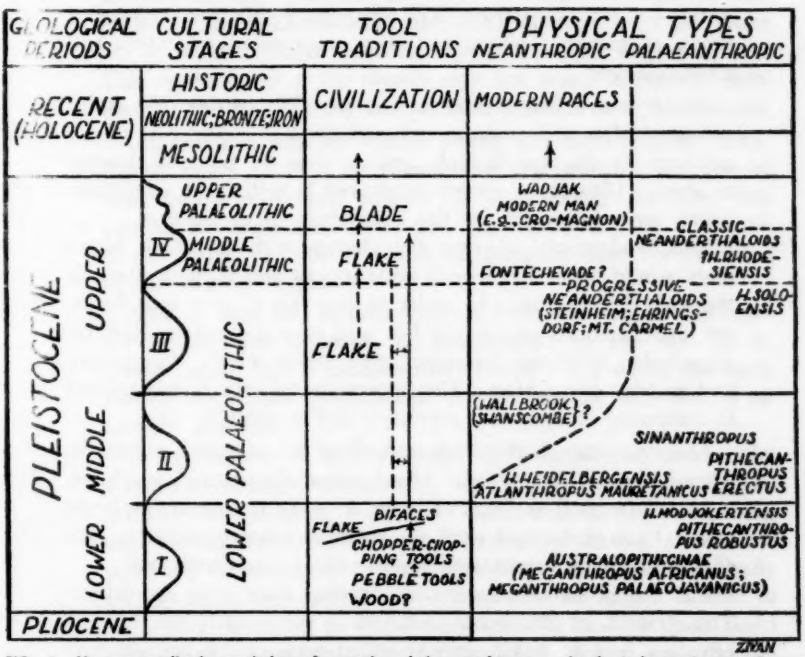

FIG. 1. Very generalized correlation of tentative dating, tool-types and physical specimens of prehumans and humans. The Pleistocene is broken down into Lower, Middle and Upper, a division which makes comparative dating across the Old World more feasible. The four glaciations studied in Europe are represented with Roman numerals, I-IV. The question mark after a specimen means I am not sure of its position; the question mark before H. Rhodesiensis indicates the fact that I am more than ordinarily unsure of its dating.

would make, were equally drawn from the immediate habitat.

Consequently, when a glaciation turned central Europe into tundra (such as we have today in northern Siberia or Canada), and made northern Africa green with vegetation, it made Man pack up and move, or else adapt himself to the new environment. The ice withdrew water from the ocean, all around the world, and often opened up new areas for Man's migration by supplying landbridges (like the one between Malaya and Java). In any given place, even where such dramatic results were not achieved, the changes of the Pleistocene were noticeable. So, for example, a given locality grew moister and covered with woods—or the opposite. The changes sometimes isolated a group of mankind, sometimes they encouraged migration and intermarriage.

Yes, it was a long period of change. We can see the interaction of Man and environment registered in changes in physical form, in changes in tools, and we can see hints of changes in ideas. Ultimately, events concurred in setting up conditions which were just right for the beginnings of civilization.

The fundamental change, the change without which Man's body would never have been what it was and is, took place in the early Pleistocene. In order to put this change into focus, we shall have to go back a bit, and take a running start by considering what the biological group from which Man sprang had to pass on to Man. This group we call the *Primates*, and is composed of apes and monkeys, and eventually Man.

The Primates—This group started out as primitive mammals. They had the characteristics of all mammals: warmbloodedness; a jointed internal skeleton of bone; a tendency to use the brain rather than the spinal cord in organizing nerve activity; care of the newborn young, including feeding them with milk.

But the primates went on to develop their own specialties. The growth of the *brain* reached a peak with the highest primates, and its architecture reflected some of the primate specialties we shall mention. The primates came to depend less and less on the sense of smell, and, instead of insisting on the big olfactory apparatuses of other animals, they tended to have

smaller noses. This allowed the development of *stereoscopic vision;* their eyes came close enough together in the front of the head to allow them to focus simultaneously on an object, and to see it in three dimensions. It is a happy fact, too, that the *teeth* of the higher primates were omnivorous teeth—not specialized for an insect diet, or for a meat diet (like the tiger). As far as teeth go, Man can do pretty well with any kind of diet.

The primates had kept a very generalized type of *hand.* (The exact opposite of this would be a specialized hand, like that of the horse—which has lost practical use of all except the middle finger, on the fingernail of which he walks.) The better of the primates could turn their thumbs about and make the tip of the thumb touch the tips of the other fingers in turn. This *opposability of the thumb* may not sound impressive until one tries to do anything complicated without using his thumbs.

Unlike those animals whose young are born almost immediately ready to fend for themselves, the primates are nearest Man in the *prolonged infancy* of their young. In Man, this reaches its peak, and offers the opportunity for the education of the young (a process which has been considerably extended in our own civilization!).

Now, if Man had inherited only a body like that of the highest of the other primates, he could never be the Man he is. I said before that a fundamental change occurred in the early Pleistocene. That fundamental change was the adoption of an *upright posture.*

Erect Posture—A little reflection will enable one to see why I call this change fundamental. It left the hands free for the intricate and delicate work that hands can do—free for using and making tools, for instance. Instead of having a head set obliquely on the spinal column, Man's head could balance freely on top of an erect column; the braincase no longer needed to be bound down by powerful neck muscles, and the face could stop being a muzzle. The brain could expand and did—in the very important forehead region and in the association areas on the sides and tops of the two hemispheres. These are evi-

dently essential, if the brain is to function in real thinking. The face could lose its protrusion (the jaws were no longer so important in procuring food and in fighting, now that the hands were on the job), and the whole masticatory apparatus could recede in under the fore part of the braincase. This process is still going on, evidently: our third molars are being lost—a process which is of profit to the dentist, when he has to remove impacted wisdom teeth.

It would be interesting to know where this great fundamental change took place. If one draws, in his mind's eye, a great sweeping curve from eastern Africa (beginning at the southern end of the continent), through India, and down into Java, he would have what I call the Primaeval Fertile Crescent. Somewhere in this Crescent, the great change took place, probably not at either extreme end of the Crescent. But I should be very much surprised if Europe, or northern Asia, or the Americas, ever yielded any evidence which would remove Man's original home from this Crescent.

At any rate, it was in a warm country that Man arose. Probably the country was semi-tropical, and predominately a grasslands area, with a few trees around. It is hard to believe that it was the real tropical forest, such as in the Congo Basin, or a country of really high mountains.

Man and the Animal Pattern—On the basis of current theory, and regarding early Man and his immediate ancestors as species of animals, we may expect their biological history to have followed the pattern of the evolution of other animals.

A small population of primates in a relatively isolated area, enjoying just the right conditions, produced the mutations which eventuated in upright posture. This happened relatively quickly. This new species then radiated out, trying out the various environments which offered chances of becoming "home" to them. In the course of time, some groups varied more quickly or more definitively. In the tangle of migrations, intermixtures and local developments that followed that first radiation we can, indeed, begin to pick out great trends; but it is often difficult to assign a particular type to a particular part

of the process. This will appear even more clearly from the discussion in the second part of this paper.

As a matter of fact, it is impossible for us to determine—solely on the basis of anatomy—exactly when a fossil braincase held enough brains for us to say the specimen had been human. It is impossible for us to judge from a jaw whether the type that possessed that jaw also possessed the faculty of human speech. So we have to turn to another category of evidence, when we wish to know whether a certain type was really human or not. That category is the *cultural.*

Man vs. Animals—The usual anthropological way of expressing the results of the great difference between Man and animals is to say that Man is the only *culture*-bearing animal.

By culture the anthropologist means that complex of historically conditioned, learned patterns of behavior which is characteristic of a specific group of human beings. This is a specific culture. When we speak of Man in general, we speak of Culture in general. Animals, too, have patterns of behavior, but they are not "learned" as are the human ones that make up culture. The basic difference, for the anthropologist, is the fact of *symbolism,* and this is shown best in language.

In dealing with the culture of a group of living human beings, we have plenty of material. Language, dress, dances, art, politics, preference in food, religious beliefs—everything is characteristic of *this* culture, and marks it off from all others. However, most of these things cannot be fossilized and preserved for the future student, the way bones can be preserved. Some tools can be preserved, and were preserved. It is these tools which help us so much in the study of early Man.

From the point of view of the anthropologist, it is not exactly the fact that Man used tools that counts. Indeed, certain animals use tools, or implements at least; objects useful for the achievement of a purpose, which purpose cannot be achieved with the bare hands, so to speak. What counts is the fact that whole collections of a certain kind of tools are found, in a given place and stratum. This indicates that the tools were made according to a pattern, a *tradition.* We simply do not have a

tradition, without *culture*. A tradition implies language, and with language we have the peculiarly human fact of a set of *learned* ways of group behavior.

No doubt earliest Man used tools made of wood, and bone. However, wood does not keep, so we can only speculate about these wooden tools. Stone does keep, so we are thrown back on stone tools. Of all the types of stone in the world, the best fitted for human tools was flint; this was the favorite stone used by Man, although often he had to be satisfied with quartz, fossilized wood, and other materials.

Man and His Tools—The earliest tools we know of (we omit the controversial eoliths) were *choppers*. (Cf. Fig. 1 for the sequence we shall briefly mention here.) These are crude tools, usually made by taking a flattened pebble from the river bed and giving it a few knocks with another rock, so that a sort of cutting edge is formed. In the western section of the Primaeval Fertile Crescent (from India to South Africa), we soon find a new tool-type, and a better one, the *biface*. This is what has been called the hand-ax. It is chipped on both sides, and eventually developed into many a beautiful specimen.

It was not long before the makers of these "core tools" (so called because the core of the piece of rock became the tool) realized that the flakes they were detaching from the core were potentially very useful. Flakes with cutting edges had been picked up and used for quite a while, of course. But now these flakes were being organized, and further chipping on them resulted in a veritable kit of tools: scrapers, used as planes; piercers and awls; gravers for incising bone and eventually for making works of art. Many of the Middle Palaeolithic tools are indeed ingenious and beautiful.

After the beginning of the Last Glaciation, another great step forward was made, with the Blade industries. Of course, blades are flakes, too, but in this case the whole tool-kit is conceived as centering on well-made, delicate blades. The difference is easier to show with specimens, than to describe. The Blade industries are always associated with a modern type of physical

Man. Incidentally, also associated with him in Europe is the great production of art, particularly on the walls of caverns.

All this time, Man lived according to a food-collecting economy, an economy which means that Man spent most of his life in scrabbling for food. The Neolithic period ushered in one of the greatest changes in way of life ever accomplished by Man.

A New Way of Life—The Neolithic ushered in the age of ground stone tools, our elders used to say. True, but something much more important happened in the Near East, about 6,000 years B.C. (much more efficient as ground stone tools were than the chipped variety). This was the Age of Domestication. Man learned to domesticate plants, sowing them in the hope of a crop much later on; and he learned to domesticate animals, for their hair, hides, meat and milk. The reverse was also true: Man himself was domesticated.

A much enhanced food supply, and a much more regular and predictable food supply, a great increase in population, the beginnings of future cities which we can see in the first agricultural villages, the beginnings of specialization which was later to furnish us with lawyers, policemen, merchants, priests, etc.; all of this happened in the Neolithic, whose benefits spread gradually over Europe, northern Africa, the Middle East, China. This was the beginning of our civilization.

It was not long before metals (first bronze, later iron) were domesticated. By this time we are in the first light of History. With the blade industries we are out of the great problem period of human evolution, physically considered; but we had to continue these paragraphs up to a recognizable time of development, simply to round out the story.

Our emphasis has been on technology, because cultural history starts with what archaeology can dig up, and these remains can only be technological. This does not mean that there is a one-to-one relationship between technology and culture. It does mean that this is the evidence with which Anthropology has to deal.

Now that we have presented, in abbreviated form, the history of ancient Man as a generalized but coherent story, we shall

describe the methods Anthropology uses in its study of the evidence available.

II. Method, Evidence and Theory

A. *The Paleontological Method*[2]

This method concerns the question: "How old is it? In what part of our time-scale are we going to place this specimen? What was the course of development?"

The scientifically worthwhile remains of Early Man are excavated from definite sites, or are found in connection with definite geological layers; and the more this work is done according to recognized techniques, the more valuable these remains are.

The most important, indeed indispensable, guide for the scientist who is excavating for the remains of ancient Man, is *stratigraphy*. Ancient Man did not leave any tidy time-capsules for us, with materials all ranged in order. Animal bones, stone tools, soil brought in by wind or water, and—later on—pieces of pottery and architectural remnants, lie heaped up where they fell. However, they are heaped up as they fell, one later than the other, one on top of the other. The layers of debris are most recent when they are on top; the earliest layer occurs at the bottom, in any particular place. This is the Law of Superposition.

Therefore, the scientist must be extremely careful to keep the materials from any given layer separate from those of any other layer. He could scoop them all up in five minutes with a power-shovel, but he would never know, in that case, which was older and which younger. Observing stratigraphy, however, he can tell which tool-form occurred before another, which physical type of Man was earlier. He can build up a *relative chronology*.

Now let us suppose that he finds he has seven layers, each with characteristic tools. Nearby, another scientist has exca-

[2] A good book for the general reader on paleontology is: Simpson, George Gaylord. 1953. Life of the Past. An Introduction to Paleontology. New Haven, Yale University Press.

vated another site with seven layers, and he has found that his two lowest layers contain the same sort of remains as our first digger has found in his two topmost layers. With due caution, they can add on the five new layers of the second site, and thus piece together a relative chronolgy of twelve layers. In this way, we have been able to work out sequences of events for rather large areas.

This method works pretty well for sites which are quite close to one another, but the farther apart the sites are, the more difficult the correlation of chronology becomes. For instance, we have to allow for a time lag between the invention of a new tool-type and its diffusion to another place.

Now, when we attempt to correlate the chronology of widely disparate places—for example, South Africa and Europe, or Europe and China—we simply do not have excavations all along the way. Also, earliest Man (before the Middle Palaeolithic) did not live in neat places, like caves, and leave us stratified evidence of his stay; he dwelt in open places, and left us only fragmentary evidence of his bones and tools, imbedded in geological layers.

Early Chronology—In these cases, we have to fall back on geology.[3] The expansions and contractions of the ice mass up north left their traces, as we have said, in and on the earth, all over the world. Sea levels changed everywhere; a wetter climate, induced by the shiftings of climatic belts ahead of the glaciation, caused the deposits to be different in a given locality from those left during drier times; the animal remains are different at different periods, because the habitats were different—these are the sort of things which enable us to hope to build up a *geochronology*.

This is still a relative chronolgy, but erected against a background of the widespread changes induced by the glaciations. We have a long way to go, before we can claim that our correlations are anything but tentative. Note that I have divided the chart not only on the basis of the various glaciations, but

[3] A good text on the Ice Age: Flint, Richard F. 1947. Glacial Geology and the Pleistocene Epoch. New York, Wiley.

also into the much more general divisions of Lower, Middle and Upper Pleistocene. These terms are particularly used in speaking of the fossils from the Far East—or any place far distant from Europe. Europe is the best known of all the areas inhabited by ancient Man, because scientists have clustered there; but other lands are becoming better studied.

A further step would be to establish the chronology of early Man in terms of years. This would be an *absolute chronology*.[4] A large amount of cleverness is being applied to this problem. There are geological methods, ranging all the way from an estimate of how long it took to build up a particular shell heap in an ancient site, to an attempt to date the end of the last glaciation in America by the recession of Niagara Falls.

But the most hopeful method, right now, is one that depends on radioactivity. An isotope of Carbon, C^{14}, is the favorite material for this method.[5] It would seem that a constant amount of this form of the carbon atom is taken in by living bodies; it disintegrates at a known rate (half is gone after about 5,568 years), so that one can measure how much is left, and get an idea of the age of the wood, charcoal, shell or bone specimen. For objects up to 30,000 years old, this method seems to be working well. But it is useless for the really old periods of Man's history—the periods when the essential problems of evolution were posed.

As things stand now, we are pretty accurate in our absolute dating back to about 15,000 years, although even within this range, the farther back one goes the rounder our numbers become. After that, the numbers get so round that I have not even bothered to put them on the chart. The best we can do is to accept an average of the estimates made by recognized experts, until something better comes along. That is why I started off the first part of this paper with the beginning of the Pleistocene at between 600,000 and 1,000,000 years. I myself favor the

[4] A resumé of dating problems and methods is given by: Zeuner, Frederick E. 1952. Dating the Past. 3rd ed. London, Methuen.

[5] Cf. Libby, Willard F. 1955. Radiocarbon Dating. 2nd ed. Chicago, University of Chicago Press.

shorter chronology, but there are many who plump for the longer one.

The fact that we have not yet been able to establish an absolute chronlogy does not mean that we should expect the Age of Man to be shortened down to a very few thousand years, perhaps, in the future.[6] All the evidence certainly points to a great length of time for the Pleistocene. This realization of the tremendous amount of time employed by Man in reaching civilization raises many problems. These problems are among those which the whole study of early Man and evolution raises, particularly when we attempt to integrate our present scientific knowledge with what I might call the traditional view of Man's history.

Helpful Sciences in the Study of Ancient Man—In studying ancient Man, the scientist does not simply unearth or find a specimen, attempt to place it in a chronological scheme—and call it a day. All sorts of other sciences are used in our reconstruction of the past.

Geology we have mentioned; it not only helps us with chronology, but tells us something of the conditions in which the particular type lived (wet, dry, etc.). *Paleontology* identifies for us the plants and animals that flourished at a certain time, gives us an idea of what Man could have used for food, and rounds out our picture of his way of life. *Geography* was extremely important to ancient Man, and is to us, in our study of him. The mere distribution of certain cultures or fossils, plotted on a map, can open up a realization of migration routes, of the type of country preferred by one group as contrasted to another, and many other interesting facets.

Chemistry is extremely important; the chemist analyzes soils and objects for us, aids in excavating techniques and in the preservation of objects. Sometimes chemistry can change many of our ideas, as the recent work in fluorine analysis has done. Since

[6] When one stood at the bottom of our excavations at Ksâr 'Akil, in the Lebanon, and looked up at the seventy-five feet of deposits, one realized that all these thirty-seven distinct layers were not built up in a short time. And they represented only the last stage of the Middle Palaeolithic, and the Upper Palaeolithic.

the chart would have been quite different had fluorine analysis not come along, I shall spend a paragraph on it.

It seems that bone is largely composed of a complex chemical substance (hydroxyapatite) which has a great affinity for the element fluorine. If the bone is lying in ground which has any water at all, it picks up fluorine from the water. If we find a bone of ancient Man in a layer with animal remains which we know (from other work) to be ancient, say from the Middle Pleistocene, we are not always sure that the human bone belongs with the other remains. It may have been buried there, at a much later time. If, however, the chemist shows us that all the bones have the same fluorine content, we are sure that the human bone belongs with the ancient animal ones. The reverse is also true. Unfortunately, this method does not work well in the tropics, as the heavy rains soon bring to bone all the fluorine it can hold. It will work in the semi-tropics, and we are all waiting until this useful bit of chemistry can be applied to some of the doubtful specimens in far-flung places.

Ethnology helps us decipher the meaning of excavated artifacts, often, because ethnologists study out-of-the-way people whose lives are as closely linked with the environment as was that of ancient Man; indeed, several "primitive" cultures are practically Stone Age, in many respects. It should be obvious that the study of human anatomy and other branches of *biology* are useful in analyzing the physical remains of early Man; *medicine*, too, finds much to offer, especially about ancient diseases.

Art, *history*, and *literature* become the more useful, the nearer we get to modern times. In short, anything a student of early Man knows is useful to him in one way or another; since he personally cannot know everything, he is forced to call in his colleagues to help him.

B. The Contemporaneous Method

The paleontological method is vertical, penetrating the past and arranging historical events in proper sequence; the contemporaneous method is horizontal, studying as it does present forms and activities of Man and animals, and comparing them,

so as to derive general principles.

Using the method of comparative anatomy, we analyze the various systems in the mammalian body (e.g., the muscles, the nervous system, the kidneys, etc.). If we set these into a series, beginning with the simplest animals and ending with the most complex, we see the analogies and developments of each system. The same is done for functional differences (e.g., motor habits, diseases, parasites, modes of life). From such studies, the ideas of the genetic relationship of animals having the same fundamental plan but with individual dissimilarities was derived. The same method is applied to the comparison of Man's body and those of the higher primates. In general, comparative studies of Man and the anthropoid apes show that physical Man is very much like the apes, except in those things which mark him off as human—and even in these, he is more like the anthropoids than one would think. This method, all by itself, could never prove genetic relationship as an historical fact; together with the evidence of paleontology, however, it provides much greater probability.

The big advantage of the contemporaneous and comparative method is the fact that we are not limited to fragmentary fossils and to the skeleton; we have these specimens in the living, moving flesh. The paleontological method is not, however, quite as badly off as you may suspect. Muscles are attached to bones, and leave their imprints on them; the brain not only influences the general size of the braincase, but leaves markings on the inner walls which tell us something of its architecture. The scientist can derive more information from a piece of bone than one might suspect, although he cannot reconstruct a whole animal from one bone, as the ignorant think the scientist pretends to do.

Genetics[7]—Another great realm of contemporaneous studies we call *Genetics*. The geneticists study inheritance. In so doing, they focus on the determinants of characteristics which are the genes, resident in the chromosomes. Chromosomes are in

[7] Cf. Dobzhansky, T. 1951. Genetics and the Origin of Species. 3rd ed. New York, Columbia U. Press; and Stern, Curt. 1949. Principles of Human Genetics. San Francisco, Freeman.

every cell of the living animal, and they are essentially the transmitters of the hereditary legacy of characteristics from parents to children, from generation to generation. When acting, so to speak, normally, they are the principle of likeness, of stability, of the opposite of change.

However, various things happen to these genes and chromosomes. One thing is: mutations. These spontaneous changes occur in the genes, and, if useful to the organism (which they usually are not), they persist. Another thing is: genetic recombinations. Genes can drop out, they can double up with other genes; parts of chromosomes can become attached to other chromosomes, during the complicated splittings and regimentations which chromosomes go through in the formation of new cells.

Geneticists have worked out an advanced science from their studies, and they have been assisted by the mathematicians.[8] The emphasis on the study of populations is a fairly recent and most important result of this sort of work. Thus, the organism is not studied as if it were alone in the world, but as it actually operates in a group of its fellows.

Just to give an example: if a pair of animals with identical genetical constitution were placed on each of a group of islands, and thus completely cut off from their neighbors, their offspring, after a number of generations, would be different from the parents, simply because of what is known as "genetic drift"—the cumulative effect of slight genetic recombinations, the fact that each pair does not produce the thousands of offspring necessary for statistical stability.

Other students of current animals and Man have brought out the tremendous importance of *geographic isolation* in the formation of new types of organisms. And, finally, still other scientists have continued to demonstrate the effects of *natural*

[8] The work of Sewall Wright on population and evolutionary mathematics is well used in the book of Dobzhansky, just cited, and in: Simpson, George Gaylord. 1953. The Major Features of Evolution. New York, Columbia University Press. Both books are of extremely high caliber, but neither is "popular."

selection. The environment gradually changes any group of animals, by weeding out those less adapted to it.

All of these processess can be, and are, studied in living groups of animals. Many of them were more striking in speed and magnitude at certain times in the past. But both the paleontological and the contemporaneous methods of study have strengthened the theory of evolution, namely, that modern Man, physically speaking, is in genetic relationship with some of the extinct non-human primates and with early human types, and in distant collateral relationship with present-day higher primates.

This does not mean that everything is as clear as day—far from it. One of the fascinations of the study of evolution is precisely the fact of ever-expanding vistas not only of knowledge but of more research to be done. But it does mean that we possess no other overall scientific theory, that fits the available facts and that inspires ever new hypotheses for more investigation. A theory, of course, is not a fact, but is often the best intellectual tool we have to work with, and we use it until we have perfected it, or until a better tool comes along.

The Evolution of the Primates—Before I go on to present the evidence regarding ancient Man, let me outline briefly what happened during the evolution of the primates. It is useful to see this general picture, and then to appreciate how Man fits into it. In following the trends of this general picture, watch Figure 2.[9]

(1) All new groups appear with what is suddenness, for the fossil records. The term is relative, geological time being what it is. This sort of appearance is usually concomitant with a disturbed period in the geological history of the world. In other words, there were large-scale changes in the environment. The

[9] This discussion, in general, is based on the publications of Simpson. Another important book, as outlining the synthetic theory of evolution, is: Jepsen, G. L., E. Mayr, and G. G. Simpson (Eds.). 1949. Genetics, Paleontology and Evolution. Princeton, Princeton U. Press. For a very good and agreeable description of the Primates, cf.: Clark, W. E. Le Gros. 1950. History of the Primates. 2nd ed. London, British Museum (Natural History).

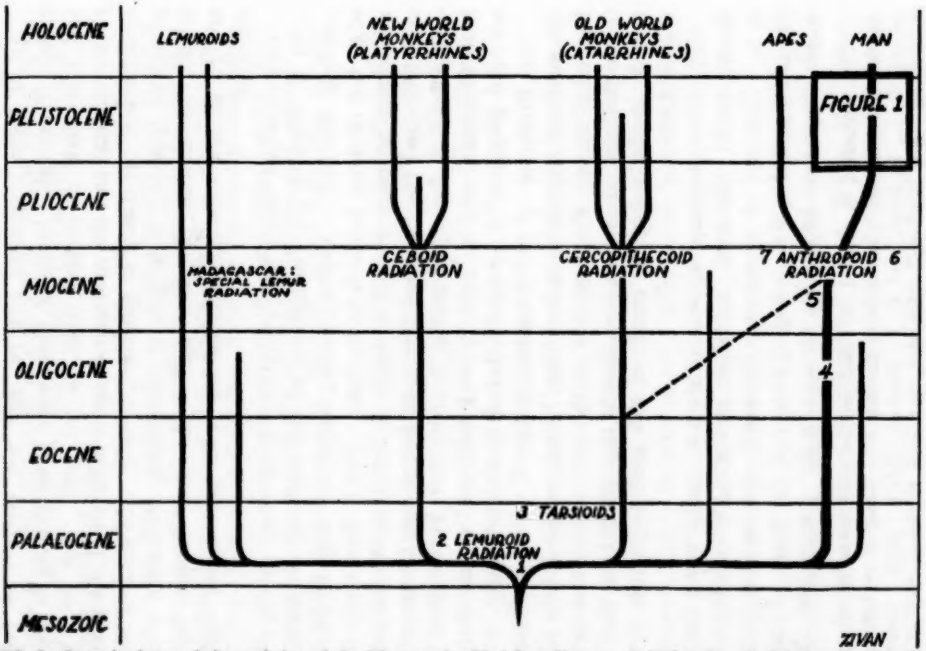

FIG. 2. General scheme of the evolution of the Primates, simplified from Simpson. 1. Notharctinae; 2. Adapinae; 3. Necrolemur, Microchoerus; 4. Parapithecus, Propliopithecus; 5. Pliopithecus; 6. Proconsul, Xenopithecus, Limnopithecus; 7. Dryopithecinae.

new group appears in small numbers. It is interesting, by the way, that the mathematicians and geneticists who discuss this speak of small numbers, of bottle-neck generations, and even of generations consisting of one pair as a possibilitiy to be reckoned with.

(2) The new "type" (phylum, order, etc.—the same phenomenon can be observed in races) then proceeds to spread out and look for various environments in which it can flourish—ecological niches, they have been called. The parent stock becomes adapted to these niches, and to the various ways of life of which it is capable (life in the trees, in water, on plains, etc.). This is known as adaptive radiation, and results in the parent type breaking up into many somewhat different types.

(3) After this, occurs a period of stabilization. Some of the new genera or species die out; as a general rule, they are replaced by near relatives (competing for the same ecological niche). The successful groups grow greater in population. We have, then, a greater number of individuals, and a smaller number of groups (genera, species, etc.).

(4) Secondary and tertiary adaptive radiations may happen later. A popular period for secondary radiations in the Tertiary was the Miocene.

(5) The analysis of relationships between forms springing from the same general stem may well be complicated by convergence. This is the result of adaptation to the same environment and general way of life, and may add to the difficulties of lining up various forms, especially when the fossil record is still scanty. In very closely related forms hybridization may occur, and its results are very difficult to distinguish from differential retention of common ancestral characteristics.

With this background of method and theory, let us now examine the actual finds of early Man's remains, and see what sense we can make out of specimens with such horrible names.

C. The Evidence for the Evolution of Man

Paleontological Evidence—It would take us far afield, and make this half of the paper as long as a book, were we to

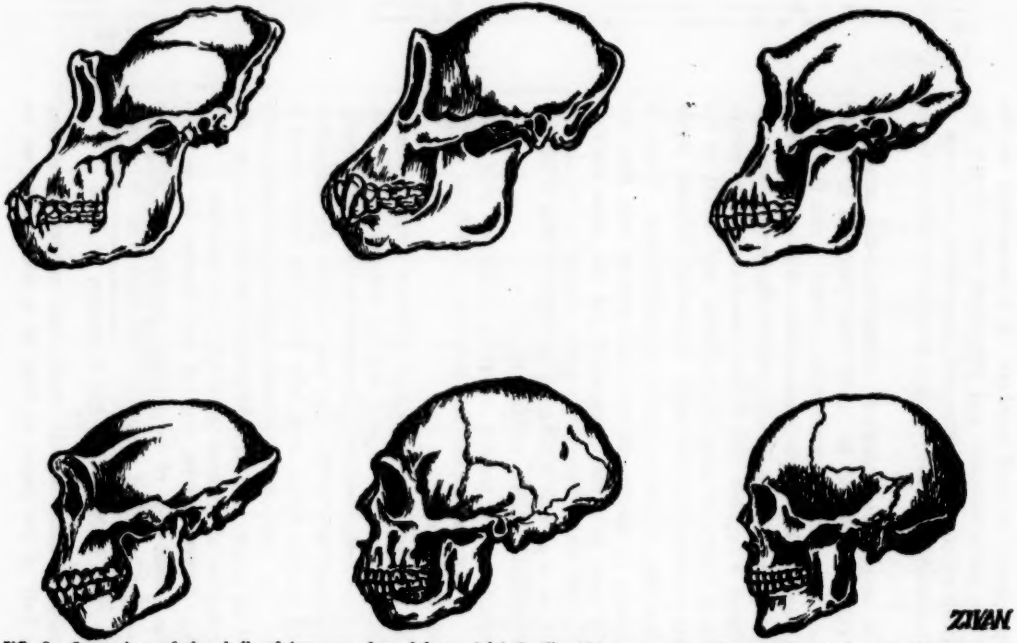

FIG. 3. Comparison of the skulls of (top row, from left to right) Gorilla, Chimpanzee, Paranthropus (one of the Australopithecines), and (bottom row), Sinanthropus, Classic Neanderthal, and modern White. Redrawn from various sources. Not according to the same scale.

discuss the various fossil forms of primates, and their possible relationship to Man. My main object, therefore, is now to outline three great trends in the physical evolution of Man, using non-human and early human material to show how these trends worked out. The first trend was the reduction of the anterior teeth, especially the canines; the second (which was rather a sudden happening than a trend), was the acquisition of erect posture; the third trend, revealing itself in early human specimens, was the expansion of the brain.

An examination of the outlines of the skulls in Figure 3, will reveal the fact that present-day apes, such as the gorilla and the chimpanzee, have large canine teeth. In Man, on the other hand, the canines are greatly reduced, and only differ from the neighboring teeth by being more pointed. The huge canines of the apes are no doubt formidable weapons, but they project so much that only up-and-down chewing is allowed, as each canine fits into a gap in the corresponding upper or lower teeth. Rotary chewing, in the human way, is impossible; impossible, too, are many of the finer movements of the jaws.

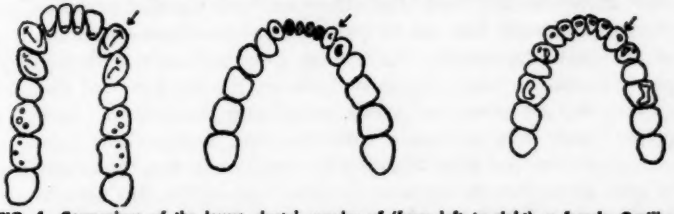

FIG. 4. Comparison of the lower dental arcades of (from left to right), a female Gorilla, a mandible of one of the Australopithecines (from Swartkrans), and Sinanthropus. In each case, the canine is indicated by an arrow. Redrawn from Le Gros Clark.

In the case of some fossil primates (and here I am thinking primarily of *Limnopithecus*, from the Miocene of Africa) the reduction of the anterior teeth is definitely foreshadowed; the molars remain large, but the canines and incisors are small. How different the dental arch of Man and the apes is, and how clear is this trend in the human direction, can be seen in Figure 4. These diagrams show the way teeth look when viewed directly from above or below. There one finds comparisons, not only between apes and Man, but with the teeth

of another group of primates, the *Australopithecinae* (often called, popularly, the South African "Man-Apes").

The Australopithecinae[10]—The Australopithecinae are found in South Africa (the scientific name means "southern apes"), and the first one discovered amazed us with the similarity of its teeth to the human. This, the Taungs skull, was the skull of an infant,—the infant higher primates always resemble one another more than do adults. However, many different specimens have now been laboriously removed from the rock, and we can make some generalizations about the group with confidence. These generalizations indicate that the Australopithecinae are extremely important in our study of the history of early Man.

The molar teeth are still large but the whole shape of the dental arch is parabolic, instead of sharply U-shaped as is the arch of the apes. This is so clear in the illustration, that I need not dwell on it. There are some details of the architecture of the brain which may indicate that the brain itself was more humanoid.

But the most striking characteristic of this group, and the reason why I have put them on the chart as the "Australopithecine stage," is the fact that they enjoyed upright posture. Strangely enough, this can be judged from one bone—one half of the pelvic apparatus. In Figure 5, which deals with the pelvic region, striking differences between the hip-bones of the gibbon, the gorilla and Man will immediately be noticed. The pelvic bones have two main functions: one, to furnish a firm attachment for the hind limbs to the spinal column; the other, to give an anchor to the muscles which move the thigh-bone. In the case of four-footed animals, the pelvic bones are long and thin; the gorilla, which is semi-erect in posture (he walks on his short hind legs and on the knuckles of his hands, which are at the end of long arms), has an intermediate flare in the pelvic bones.

In Man, the pelvic bones are wide, for the top part (the

[10] There is no general book available on the Australopithecines. Their study is developing so fast, that only technical papers and monographs exist. However, see Clark, cited previously.

FIG. 5. Comparison of the pelvic regions of (from left to right) the Gibbon (here representing an essentially quadrupedal pelvis), the Gorrila, and Man. Redrawn from Hooton.

ilium) has to afford an anchorage for the big muscles which enable us to stand upright, and to kick back with our legs. These muscles are called the gluteal muscles, and are the basis of our buttocks. No other animal has real buttocks. The point of this discussion is the fact that a pelvic bone of one of the Australopithecinae has been found which is indistinguishable from the human bone in the upper part (ilium), and yet somewhat different in the other two parts (the ischium and the pubis).

In addition to the evidence of the pelvic bone, we can also see erect posture reflected in the position of the foramen magnum. This is the aperture in the base of the skull, through which the spinal cord reaches the brain. In the case of lower animals, and to a lesser degree even the most developed apes, this aperture is towards the back of the skull, and points backwards. In the case of modern man, it is definitely well forward, and points downward. In the Australopithecinae, it is much more human than anything else.

Work on the new skeletal finds of the Australopithecines continues apace, as new bones are extricated from the rock in which the ages have embedded them. I was very much struck, at a recent anthropological meeting, by the complete spinal

column of a female. The feature that particularly impressed me was its small size. This is an important point, which I bring up here so that it may be remembered when considering the various brain sizes of the specimens mentioned. The brain size must be considered in comparison with the total body size. Otherwise, we should consider the whale brain, on the basis of size, the most intelligent brain in the world.

Brain size is expressed in the cubic centimeter capacity of the braincase. Even though the Australopithecines average out out at something over 500 cc., and we can see that the absolute brain size is that of a modern chimpanzee, still we must remember that the average Australopithecine probably weighed no more than fifty pounds.

However, the brain equipment was still sub-human. In addition to brain size, the details of brain architecture must be taken into account. From this point of view, the Australopithecines were apes rather than men, although we must admit that they looked forward, so to speak, to the human condition.

By and large, then, we have here a set of creatures which have achieved erect posture, but represent a stage antecedent to the tremendous expansion of the brain which is so particularly human. It is interesting in this connection to note that there seems to be some evidence that these creatures used implements (e.g., the thigh bones of large animals with which they bashed in the skulls of the baboons on which they may have fed), and we are eagerly awaiting confirmation of the first reports that choppers have been found, associated with their remains.

Our dating of these forms is tentative, but they now seem to have occurred in the Lower Pleistocene. Perhaps they were peripheral forms (South Africa is, after all, at one extreme end of the Primaeval Fertile Crescent), and certainly no anthropologist I know of is ready to say they were the actual ancestors of Man; nevertheless they represent an extremely important stage—the sort of thing that must have happened in the very beginning of the early history of Man.

Now, we have two other specimens which indicate that the

Australopithecine form was widespread. One was found in East Africa (*Meganthropus africanus*), and the other in Java (*Meganthropus palaeojavanicus*). These other two forms are represented by lower jaws, but there is enough of them to show us that they, too, had large molars and reduced front teeth. Until we find more of them, my linking up these three groups is tentative.

The reader will remember the radiations depicted in Figure 2. I cannot prove, with actual specimens of physical mankind, that such radiation (or better, *split;* see Figure 1) occurred during the middle Pleistocene, but there are hints from physical evidence, and even stronger hints from the stone tools. Mind you, this radiation was nowheres so important as the radiations of major new types of animals: we are dealing with what are really minor variations among racial groups of the same species. Some scientists would make modern man the descendant of the earlier types, and the "split" would occur, according to them, very late (third interglacial, for instance). I am somewhat inclined to put it earlier, but I am prepared to change my opinion, should new evidence urge me to do so. However, it is clear that, sometime during the Pleistocene, a split occurred, which was to yield two widely divergent types of humans, one type remaining on as modern Man, the other becoming extinct.

New-Fashioned and Old-Fashioned Man—The two types of humans I have labelled on the chart: *Neanthropic* and *Palaeanthropic* ("new-type" and "old-type" man). Let us take the Palaeanthropic first. This group could be called "Conservative." They retain the *braincases* of their ancestors—thick-walled, small in capacity; long, low, and wide at the bottom. Evidently the forehead, with its important frontal lobes, and the upper middle part, with its associative areas, had not yet developed as much as ours have. Above the eyes are large struts of bone, the supraorbital tori, which obviously correlate with the large, protruding lower faces—the masticatory part—heavy, projecting, chinless. There are many other characteristic differences,

but these are the main ones, evident even in the outline sketches of Figure 3.

The other end of the Primaeval Fertile Crescent, the Far East, yields our most interesting and informative collection of the earliest known members of the Palaeanthropic branch of humanity. In the last stages of the Lower pleistocene, we have *Pithecanthropus robustus*, probably a heavier ancestor of *Pithecanthropus erectus*, and *Homo modjokertensis* (found in Modjokerto, Java), probably an infant form of P. erectus.

These are the people Coon calls the "half-brains"; their cranial capacity averages a little over 800 cc. They are also a much heavier group than were the Australopithecines, and the weight of one of them has been estimated at 150 pounds.

Somewhat to the north of the Pithecanthropus area, and occurring somewhat later in time, we find the individuals of *Sinanthropus pekinensis*, dug up at Chou-Kou-Tien, near Peiping. These are cousins of the Pithecanthropus group. They are somewhat more primtive in some things (e.g., teeth) but more advanced in other directions. Thus the capacity of the braincase is, on the average, slightly over 1000 cc. The tools made by Sinanthropus, while still in the chopper tradition, are advanced over those found in levels of the time of Pithecanthropus.

It seems that the Far East was a conservative cultural province. In Africa, the earliest pebble tools, which are choppers, soon disappear, and bifaces appeared, to remain an important part of the tool-kit, even after flake tools began to be made.

That people of the same biological cast as Pithecanthropus could make bifaces is indicated by one of the most recent finds of early Man. This is *Atlanthropus mauretanicus*, from northern Africa. Two jaws, indistinguishable from those of Pithecanthropus, were found in association with Acheulean bifaces.

Other Old-Fashioned Men—I shall deal somewhat summarily with the other Palaeanthropic finds, and then turn to the Neanthropic. *Homo heidelbergensis* is represented by a lower jaw, found near Heidelberg, in Germany. Located in time as having

lived during the second glaciation, this specimen had an extremely interesting jaw. The bony part is huge and has some pre-human characteristics (although it is as human as Pithecanthropus or Sinanthropus in the chin region) but the teeth are definitely human. The teeth, incidentally, are small for the jaw, but we are not surprised that such a situation could exist, because we have evidence that the size of the teeth and the size of the jaw have different genetical backgrounds. I have put Mr. Heidelberg near the line separating Palaeanthropic and Neanthropic, for there is no reason why he could not have been ancestral to a modern type of Man. Of course, we should like to have more than a jaw, before making any further definite statements.

What Hooton has called the "asymmetry of evolution" shows to advantage in *Homo rhodesiensis,* which I shall use to introduce the Neanderthaloid group. Rhodesian Man was found at the bottom of a steeply slanting cave in Broken Hill, in northern Rhodesia. We do not know how old this specimen was, and I have placed it more or less in the Upper Pleistocene because of some evidence from the chemical analysis of the bones. But it could be much older, and I suspect it is. The brain case is still smaller than that of modern Man (about 1305 cc.). The skull has the largest ridges over the eyes that have ever been seen on a human skull, and they are peculiar in shape, compared to those of standard Neanderthal Man. The upper jaw, while tremendous in size, is definitely human, and equally definitely not Neanderthal's type. The best we can say is that this type of Man was about on the same level of development as Neanderthal Man.

The same remark can be applied to *Homo soloensis,* found within six miles of the place where the original Pithecanthropus discovery was made, in Java. If we line up pictures of Pithecanthropus, Solo Man, and the later Wadjak Man and the modern Australian aborigine, we have the clearest example of a series of skulls retaining a family likeness yet gradually progressing to modern status, that is available to us. As in the case of Rhodesian Man, some features of the skull of Homo

Soloensis are more advanced than their counterparts in Neanderthal Man.

Neanderthal Man—We come now to a much-discussed group, the Neanderthals. Specimens of this group have been popping up for over a hundred years now, and we have parts belonging to more than a hundred individuals. This type is discovered in Europe, and we can date it very accurately, to the first and greatest advance of the last glaciation. Living as they did in caves, they have left much more information about themselves than any previous type we have met. They deliberately buried their dead (which many take as evidence that they believed in an afterlife), and have even left us what look like the remains of religious practice—in one case a treatment of bear skulls which strongly recalls the bear cult of several modern peoples. Their tools were well made and varied. But even a beginning student of ancient human anatomy can tell Neanderthal bones from those of modern Man.

I am now describing what is called on the chart the "Classic" Neanderthaloids. The braincase held a brain which could be, on occasions, even larger than modern human averages (one of them had a capacity of 1600 cc.); but the case was extremely low and long, with a very retreating forehead and a peculiar, bulging occiput which belongs only to this type of Man, and the brain itself seems to have been less than modern in architecture. The base of the skull gives room for the attachment of very large neck muscles, and the evidence in general pictures a head which was slung farther forward than ours, on a squat body. The face, adorned with good-sized teeth, protruded much more than does our face. Practically every small detail was different from the corresponding detail in modern Man, and each was primitive. In fact, when first found and before we had other really primitive specimens, Neanderthal was very naturally considered precisely the thing to place between apes and men, and thereby triumphantly to prove evolution!

Life has grown more complex since those days for everyone, including the anthropologist. We may regret it, but we can also rejoice in having learned more. The various Nean-

derthaloid types we have discussed show the effect not only of genetics but also of geographical isolation in the varieties of types which resemble each other in some ways, differ in others. Not only can we have parts of the body which have progressed or changed more than other parts (like the teeth and the jaw of Heidelberg Man), but variations were induced by the fact that ancient Man lived in various parts of the world, and thus developed local varieties. In addition to all this, we have the possibility of hybridization. The different groups, although smaller in numbers than modern racial groups, did wander around and intermarry. I must admit that it is extremely difficult to tell whether a particular state of affairs is due to one or the other factor. But the old concepts of the "family tree" of mankind, with dogmatic and neat straight lines joining the few fossils then known, have given way to more realistic evaluations. Some liken these new ideas to a tree, with many branches and with connecting links between the branches. Others prefer to speak of several main streams, again connecting at different points; but even the main streams are composed of cognate forms which are more or less closely related with a wide range of variation.

That last paragraph was by way of introducing the "Progressive Neanderthaloids", which appear earlier than the Classical. The skulls discovered at Ehringsdorf and at Steinheim, both in Germany, and at Mount Carmel, in Palestine, are recognizably Neanderthaloid, and yet they lack many of the characteristics of the Classic folk. When they differ from the Classics, it is in the direction of the Neanthropic (higher braincases, a chin, less supraorbital boniness). These progressives are from the third interglacial, and thus antedate their Classic relatives.

How are we going to explain these people, if they are more evolved, in the modern direction, than the later members of their clan? First of all, there is no absolute law against reversion to the more primitive. The Classic group occurs always in northern Europe, that is to say, north of the Mediterranean. They could well have been an adaptation to the cold they found there, particularly during the first part of the fourth

Glacial. Stocky, thick-set people, it would seem that they specialized for life in a cold country. Personally, I find it hard to believe that they regressed so far (for in many respects they are more primitive than much older forms). Secondly, one will notice that the European Progressive Neanderthaloids are found only in an interglacial (i.e., warm) period; the Mount Carmel specimens occur in what always has been a warm country, Palestine. There is considerable reason to believe that the ancestors of modern Man were predominantly lovers of warm climates. Therefore, one may make the hypothesis that the ancestral Neanthropic branch did not meet the Palaeanthropic branch in Europe, except during warm periods, until the time of really modern Man, who determinedly encountered Neanderthal Man in Europe during the last glaciation. The extinction of Neanderthal Man followed.

This is a theory, and until recently I held to it with great enthusiasm. However, now I have begun to doubt the real Neanthropic nature of specimens supposed to occur before the time of the Classic Neanderthaloids. Until we are able to demonstrate that Neanthropic Man definitely appeared before the Classic Neanderthaloids (thus proving the possibility of hybridization), we should think seriously of an alternate theory. This theory proposes that the Progressive Neanderthaloids were the ancestors both of the Classic Neanderthaloids and of modern Man. According to this theory, the "split" we spoke of several pages back occurred during the third interglacial, instead of earlier. This split, I still think, was at least partially achieved earlier than the third interglacial.

This little disquisition on the Neanderthaloids has served, I hope, to point up some of the difficulties of interpretation of fossil Man, even in a period for which we have considerable evidence.

Neanthropic Man—At any rate, the demise of the Neanderthals occurred at the end of the first third of the last glaciation. That was the end of the line for the Palaeanthropic group. We have much less to describe, when discussing the Neanthropic group. First, because there are fewer specimens, and second,

because it is our own line, and its characteristics are ours.

One of the first candidates for an ancestral position in the Neanthropic line is Swanscombe Man, found at a place so named, on the banks of the Thames River, in England. Unfortunately, we have only the back of the head, in this case, so we know nothing of the forehead and the face. For quite a time, I thought this a likely candidate for an ancient ancestor of Neanthropic Man. He may still be such; but I now think that we can be sure that he is only nothing more than a Progressive. Neanderthaloid. However, for his advanced age, this is considerable. By the second interglacial, there was a type of Man who could have been ancestral either to modern Man or to the progressive Neanderthaloids, or both.

During the third interglacial, at Fontéchevade, in France, there lived a person, who, again, could have been Neanthropic or at least Progressive Neanderthaloid. I personally think he was the first, but I cannot prove it, with the meager evidence this fragmentary skull has afforded us.

What is important, for our story of ancient Man, is the fact that, at the beginning of the Upper Palaeolithic, with the introduction of the blade industries, during the last glaciation, an almost completely modern type of Man appeared all over the Old World. The word "almost" is to be taken in a very technical sense. Upper Palaeolithic Man was perhaps more rugged and bony than we are, but it would take an anthropologist and his measuring instruments to make the differences mean anything at all.

A popularly known type of this period was Cro-Magnon Man, the first found, in the south of France. There were other types flourishing at the time, but all akin. In fact, with the Upper Palaeolithic, we are in the full light of modern man day, as far as physical build is concerned, and from here on the differences are purely racial—a field which I shall not even begin to encroach upon, in this paper.

D. Conclusion

What is the general conclusion of our discussion? It seems clear that we have types of beings occurring early in the his-

tory of Life different from those which occur later. This leads to a general theory of evolution. Specifically with regard to Man, it seems clear that we have different types flourishing in the early Pleistocene than in the Upper Pleistocene. It further appears that early and antecedent forms are more primitive (in the sense of being more similar to non-modern forms) than the later specimens. We also witness, as we trace this history of humanoid and human forms, a development which is important in teeth and in posture, but which is overwhelmingly important in growth of brain.

Neanthropic Man differs from Palaeanthropic Man in the enlargement of the braincase, especially in the frontal and parietal areas, much more importantly than his difference in bone thickness, face protrusion, etc., although these are correlated with brain differences. In other words, we have here an evolution of more primitive Man to more modern Man.

There are many difficulties in our reading the ancient history of Man. Early Man was chary about leaving his fossil remains for us to find and interpret; the fossils we find need the aid of theory in their interpretation. I have tried to tell the story of ancient Man, as I see it, and my reasons for so seeing it. There are some points with which other scientists would not agree, because different conclusions can be reached from the same facts. But I think that the overall theory is sound: the theory of evolution is valued by the scientist, because there is no other available framework of explanation (a framework for which there are numerous positive facts), and because this framework is fruitful in stimulating research and new theories and hypotheses. And it is a theory which brings out in dynamic relief the picture of Man, the crown of the material universe, with ancient and ancestral roots in that material universe; Man, who can legitimately aspire to be brother to the Angel, obviously and by blood relationship akin to all living things on God's earth.

APPENDIX

THE PRESENT CATHOLIC ATTITUDE TOWARDS EVOLUTION*

In this Appendix, we are to discuss the current *informed* Catholic attitude with regard to the evolution of Man's body and allied questions. In many discussions it is necessary to distinguish between what an anthropological friend of mine calls "folk Catholicism" and the attitude of theologians and other well-educated Catholics. Such a distinction is particularly appropriate in a discussion of evolution. Today we are witnessing a re-evaluation of this topic by theologians, and many Catholics have not kept up with theological thinking.

Therefore, I shall first state the Catholic attitude, as of now. I shall then briefly discuss the sources of this attitude, (a) from the point of view of the Bible, and (b) from the point of view of Dogma.

1. The Catholic Attitude as of Now.

Basic to this attitude is the fact that there is no officially proclaimed doctrine of the Catholic Church which is in contradiction with a theory of the evolution of Man's body.

We shall see how this statement squares with the reluctance (currently less than it was, but still existing) of theologians to welcome evolution. Part of the answer here and now, is apparent in the fact that I have written "*a* theory of evolution", and not "*the* theory. . ." In the minds of many, "*the*" theory of evolution is a materialistic one, and one which has permeated much of modern philosophy and social thinking. But a Catholic scholar can safely explore a spiritualistic theory of evolution, while he could never be an adherent of a completely materialistic theory.

*I am particularly indebted to the Rev. George Glanzman, S.J., Professor of Old Testament, at Woodstock College, Md., for his counsel concerning this appendix.

For a Catholic is bound to believe—and that because of the most weighty authority the Church can give the doctrine—that all men (and hence the first man) are endowed by God with spiritual souls. This soul is an immaterial and substantial principle, directly created by God for each man. Spirit and matter are on such essentially differing levels of being, that matter, of itself, could never produce a spiritual soul. United with matter, the soul infuses it with essential humanity. Each man is a unit, composed of spirit and matter, inextricably fused, while that man is alive on earth.

This demand of the Church for belief in the human soul should hardly come as a surprise to anyone (unfashionable as the word "soul" is in many circles today), because there would be no point to religion at all, unless Man possessed a spiritual soul. At any rate, it means that no Catholic can hold a theory which claims that Man is nothing but an educated ape!

In connection with problems that may arise, when one compares Catholic teaching and a theory of evolution, we must note several other beliefs of Catholics.

The first is the belief that all living humanity had two original parents. This is by no means as fantastic as many modern secularists may think. They have grown up in an intellectual atmosphere which jeers at the "myth" of Genesis; they would be hard put to it, to document their attitude; certainly none of them has examined the true meaning of Genesis as has the Catholic exegete or dogmatic theologian, nor appreciated its meaning in the context of the total teaching of the Church concerning original sin and the Redemption.

Actually, we know of Adam and Eve only from revelation, and a belief in an original pair is not in conflict with any real scientific evidence. This belief means that the Catholic cannot hold the thesis that mankind subsequent to Adam derives from many truly human sources, or from a single but group source.

Finally, the Catholic must believe that our first parents were constituted human beings by the direct and immediate action of God, an action that affected both soul and body. This therefore, is one of the rare times when God interfered with na-

tural history[11]; His direct action was necessary because of the spirituality of the soul, just as He had to create a soul for each one of us today.

God may indeed have used a body prepared for the soul as far as possible by evolution (as opposed to the relatively unorganized matter mentioned in Genesis). But this body could not have been properly called human, before the spiritual soul was infused into it. Nor could it be called man unless, antecedent to the infusion of the soul, or at least because of the infusion of the soul and concomitantly with that infusion, the body was radically reorganized, so that this matter was elevated to the stature of the human. This reorganization occurred on the deeper level of being, which we might call philosophical. It is very possible that the change that took place would escape the detective potentialities of science, and particularly the powers of palaeontology. In our paper we have shown how abundant, and yet how crude and fragmentary is the evidence available.

In sum, we may say that the Catholic must believe that Man was constituted Man by the immediate action of God (this constitution was his, as opposed to that of all other visible beings of the Universe), precisely as he is not merely a material being; he was "made in the image and likeness of God" because of his soul.

This set of beliefs on the part of the Catholic does not in any way impede him from pursuing scientific studies about evolution or early Man, any more than a belief in a spiritual soul keeps a Catholic psychologist from studying human mental activities or a Catholic anatomist from studying the architecture of the human brain. All the external or autogenetic influences on Man, all the possible categories of human behavior (cultural, physiological, psychological, idiosyncratic) are as much open for investigation by a Catholic scholar as by any other. In short, Man can be considered as an object of natural science by the

[11] The theologian Suarez puts the general principle thus: "God does not interefere directly with the natural order, where secondary causes suffice to produce the intended effect."

Catholic.

No doubt this brief statement has raised a number of questions in the reader's mind. For example: How can the Church, which claims that her doctrine is divine and therefore immutable, change her attitude towards evolution? What right does the Church have to dictate to the Catholic scientist in matters which are outside of her religious realm? These and other questions will be touched on in the ensuing two parts, which essentially are aimed at giving the theological documentation for our initial statement.

2. Documentation: Background Concepts.

In this matter, as in all others, the primary fact for the Catholic is that he believes the Church to be an institution which is teacher, law-giver and sanctifier. In these functions, the Church is the mystical continuation of the historical Christ, Who possessed these functions and Who transmitted them to the Church. The Holy Spirit guarantees the continued purity of doctrine of the Church. In a word, the Catholic believes what the Church teaches.

But there is an economy in Divine Revelation. Not only is it restricted to religious truths, but God has not, so to speak, satisfied our curiosity about every single detail or aspect. Not only can we grow in appreciation of religious truth, but certain facets will probably always elude us.

Christ's Church not only, therefore, guards that immutable body of revealed doctrines (which we call the "deposit of Faith"), but also rules over that progress in the understanding of Revelation which comes from a growth in realization of relationships, and from a growth of clarification which is derived from experience. Perhaps more importantly for the individual Catholic in his daily life, the Church supplies us with norms of belief here and now, from day to day. These norms are not merely intellectual—they are also practical; these norms are not only for the highly educated—they are also for all Catholics, of high and low degree. For the Church has a universal responsibility for all Catholics.

Now, the Catholic believes in many doctrines, and the ordinary Catholic is, perhaps, undiscriminating in his belief. But the theologian (a professionally educated Catholic) arranges Catholic beliefs according to their order of authority.

Some doctrines are *defined*. These doctrines are declared infallibly and irrevocably true by a Pope or an Ecumenical Council. Thus, the definition that every man possesses a spiritual soul. Such a doctrine will never be changed.

Definitions are not arbitrarily issued, but are made because of some need; thus, the doctrine may be under special attack. There are many doctrines not defined, but believed by the Universal Church, because they are intimately interrelated with defined doctrines, or are obviously taught by the universal tradition of the Church.

This tradition is not simply the handing down of stories from generation to generation, but the traditional belief as proposed by the Universal Church, the infallibility of which is guarded by the Holy Spirit.

The day-by-day teaching of the Church (*Magisterium* is the technical word) is shown in its highest form in a Papal Encyclical, which becomes the proximate norm for the theologian, in his studies, judgments and theories concerning the doctrines involved.[12]

In attempting to characterize *informed* Catholic opinion on any subject, including evolution, we must emphasize the role of the Catholic theologian. In matters which are not clearly defined or otherwise placed outside the pale of basic debate, the Church usually leaves the field to the studies of her theologians, unless or until there be need for more official action on her part. The authority of theologians, as a body, is great, because they teach and write publicly, and hence are eminently susceptible to inspection and correction by the Church.

The majority opinion of theologians is, then, important as a guide, here and now, for the belief of the Catholic. This opinion

[12] For an extended treatment of the sources of theology, cf. Henry, A. M. (Ed.). 1954. Introduction to Theology. Theology Library, Vol. I. Chicago, Fides.

on certain subjects may change, for a variety of reasons. But at any given time, the majority opinion of theologians is the safe and prudent one for Catholics to follow.

One more important note, and we shall get on to an assessment of the sources available to the theologian for his opinions concerning evolution.

The Church, and, according to his office, the theologian, has to do more than safeguard the purity of doctrine, regarded as a purely intellectual thing. The moral implications of doctrine are basically important in human life. And the Church is not only committed to the care of intellectuals; it has all the range of humanity within its fold. The Church's officials, therefore, must be prudent in their statements and actions, from every point of view.

3. Documentation: The Bible.[13]

For the last three hundred years or so, it has been more clearly realized than ever before that the Bible is not a book of science.[14] Indeed, "science" as we know it, is a modern phenomenon in human history. It would have done little good, all these centuries, if the Bible had been couched in scientific terminology (providing everything science now teaches be forever true, a proposition with which no scientist could agree).

No, the Bible is a religious book, and we should look in it for evidence concerning a scientific problem, only when Revelation has offered us knowledge pertinent to that problem.

Linked with our first statement is a cognate one: any given part of the Bible is written in a human language. A human

[13] The methods of the Scripture scholar are well portrayed in the following books.

Jones, Alexander. 1951. Unless Some Man Show Me. New York, Sheed & Ward; and Hauret, Charles. 1955. Beginnings: Genesis and Modern Science. Dubuque, Priory Press.

[14] One of the most famous remarks on this subject is attributed to Cardinal Baronius (at the time of the Galileo controversy): "Holy Scripture was written to teach us how to go to heaven, and not how the heavens go." The last vestige of the opposite attitude died out with Concordism, which was an attempt to correlate the eras formulated by science with the actual text of Genesis describing creation.

language does not exist, floating around in a vacuum; it is spoken by a definite group of people equipped with a definite culture. A definite culture means that these people see the world and talk about it differently from other people.

Thus the exegete, in striving to ascertain exactly what God revealed, must take into account what is usually called the literary style of the passage or passages involved. So it is that interpretations can differ as knowledge grows. An example of this is the fact that many exegetes today say that a symbolic interpretation of the derivation of Eve from Adam is possible. They say that the lesson here may well have been the idea that women were really human—as opposed to the low status of women in many pagan cultures. Again, the sacredness and indissolubility of marriage is a lesson to be gained from the text, or, again, the fact that the man is the head of the family. Adam could just as well have been the cause of Eve inasmuch as he was the pattern, so to speak, according to which she was made, and not necessarily her physical cause. Please note here, however, that the basic truth inculcated by the first part of Genesis is never changed—God will always be the Creator of all things and of Man. The exact way God acted is of lesser importance.

The primary rule of Biblical interpretation was made clear by St. Augustine about thirteen centuries ago, and it has been reiteraterd in two of the great papal Encyclicals on Scripture study, *Providentissimus Deus* and *Divino Afflante Spiritu*.[15] This rule is simple: the sacred text is to be taken as meant literally, unless reason or necessity demand that we interpret it otherwise.

Of course, some texts are obviously metaphorical—the Lord is said to have an arm, for example, whereas God is a pure spirit. But, until 1859, there was no particular reason to doubt the literalness of the Genesis description of creation.

Now the Catholic, and especially the conscientious exegete, does not change his traditional interpretation of a text of Sacred

[15] These two Encyclicals, and many other useful documents, are contained in: Rome and the Study of Scripture. 4th ed. 1946. St. Meinrad, Indiana. A Grail Publication.

Scripture just because of his early-morning disposition or because someone says it would be nice to change. He demands solid reasons for such a change. It is not often appreciated by scientists that the actual and basic proof for the evolution of Man (which is, of course, the palaeontological) was very, very slim in 1859, and did not improve much until near the beginning of the twentieth century. We have discovered more human fossils in the last twenty years than ever before. It is also not often appreciated by scientists that when the theologians turned to the writings of scientists to find out the reasonableness of their case, they very often met with contradictory statements.

So we cannot blame the exegetes for not wanting to act like weathervanes. Even today, although they have been investigating the possible relationships between Scripture and evolution for a long time, they treat this latter as not yet certainly proven, although, together with the dogmatic theologians, there are many more favorable to it as a theory than there were fifty or sixty years ago.

We should like to submit a great deal of historical material on this topic, but space is short. Under this heading, however, we must give a brief account of the decrees of the Biblical Commission, set up by Pope Leo XIII in 1902. Although the decrees we shall discuss were handed down in 1909, they are not merely historical, since they are still in force. The Catholic is required to give internal prudential assent to these decrees, since they are approved by the Pope and represent a specializd form of the ordinary teaching function (Magisterium) of the Church.

At the time these decrees were issued, the Bible in general, and the traditional human authorship of parts of the Bible, were under heavy fire from non-Catholic scholars. At the same time, some Catholics (the Modernists) proposed the opinion that the Biblical narratives were mere myths, with no historical value, to be interpreted any way one desired.

Today, the debates of the early twentieth century have subsided. Non-Catholics have gained a greater respect for the Bible as an historical document (archaeology, for instance, has helped);

Catholics have become less concerned about authenticity (e.g., whether Moses wrote the whole Pentateuch, or was the main influence in its composition), and more concerned with the content and meaning of the various books, which are inspired, no matter who their human authors were.

In the midst of violent attacks on the veracity and historic value of the Bible, the Biblical Commission issued eight decrees, which are notable for their Catholic spirit.[16] In spite of the atmosphere of hectic polemics at the time, the decrees follow the Catholic way, the *via media*, the moderate way of common sense. These decrees, in essence, said that the *real* meaning of Scripture should be followed. They took the middle path between Fundamentalism and Modernism.

We should like to present and comment upon all eight of these decrees, but for the purposes of this discussion the third is of outstanding importance. In this decree the Commission indicated those fundamental teachings of the first three chapters of Genesis which were not to be disregarded by Catholics, be-

[16] The text of the two decrees that are most pertinent to our discussion is as follows. Translation from "Rome and the Study of Scripture", p. 114, and p. 115. 3rd Decree. "Whether in particular we may call in question the literal and historical meaning where there is question of facts narrated in these chapters which touch the fundamental teachings of the Christian religion, as for example, the creation of all things by God in the beginning of time, the special creation of man, the formation of the first woman from man, the unity of the human race, the original happiness of our first parents in a state of justice, integrity, and immortality, the divine command laid upon man to prove his obedience, the transgression of that divine command at the instigation of the devil under the form of a serpent, the fall of our first parents from their primitive state of innocence, and the promise of a future Redeemer. Answer: In the negative."

7th Decree. "Whether, since it was not the intention of the sacred author, when writing the first chapter of Genesis, to teach us in a scientific manner the innermost nature of visible things, and to present the complete order of creation but rather to furnish his people with a popular account, such as the common parlance of that age allowed, one, namely adapted to the senses and to man's intelligence, we are strictly and always bound, when interpreting these chapters to seek for scientific exactitude of expression. Answer: In the negative."

cause they are intimately connected with basic truths of Christian doctrine.

For our present purposes we may quote the following of these fundamental teachings: ". . . the creation of all things by God in the beginning of time, the special creation of Man, the formation of the first woman from man, the unity of the human race. . ."; and also there were statements concerning the constitution of our first parents in grace, their fall, and the "promise of a future Redeemer."

Now, much has happened since June 20, 1909. We have had the Encyclical of Pius XII, *Divino Afflante Spiritu* (1943), in which our present Pontiff notes, among many other topics pertinent to Biblical studies, the fact that the exegete must be careful to search out the true meaning of the text by using all possible aids, including the analysis of the real meanings expressed by Eastern literary forms. The Pope also points out that patient collaboration has solved some of the problems that plagued exegetes in the time of Leo XIII, and that future patient collaboration of all types of disciplines, sacred and profane, may be expected to solve the problems that confront them today.

We have had the letter of the then (1948) Secretary of the Biblical Commission, Fr. Vosté, to Cardinal Suhard of Paris. Concerning this letter Fr. Jones writes [17] that the letter "emphasizes the 'popular' character of the sacred account of human origins and asks for a further examination of the religious problems involved. It also recalls the words of the Holy Father in which the Catholic exegete is urged to solutions which, while fully respecting the Church's doctrine, will take adequate account of the *proved* conclusions of the natural sciences. It is an invitation no true Catholic will refuse."

We have had most recently two reviews of the new official Enchiridion Biblicum (an official hand book of ecclesiastical sources concerning Biblical studies), from the present Secretary and Sub-Secretary of the Biblical Commission. These reviews indicate how the decrees of the Commission must be considered in their historical context, and how confident the Church is that

[17] *Op. cit.*, p. 98.

her men of science in the Scriptural field will work out many questions now somewhat obscure.[18] This is an echo of the confidence expressed by Pius XII in the Encyclical already noted.

But most importantly we have had the Encyclical *Humani Generis* (1950), which we shall examine in some detail in the next section. This encyclical forms the bridge between our two sections, for, while it contains normative directives for the Biblical scholar, it is predominantly a dogmatic document.

4. Documentation: Dogma.[19]

The basic attitude of a theologian toward any given question is quite different (as one might expect) from that of a scientist. For the theologian, Revelation is transcendental, that is, it is the supremely important phenomenon of the Universe—because of its Origin and because it leads to life eternal, the value of which far outstrips any concern of this transitory earthly life.

The concepts of God and Heaven, I may say, make human knowledge and science pale and less fascinating.[20]

This is to overstate the case somewhat, because the Church (notably in the decrees of the Vatican Council) has often come to the defense of the power and the essential rectitude of human reason. Indeed, in our times, Catholic philosophy is the champion of human reason against those who deny it any possibility of valid contact with real truth.

However, the theologian gives primacy to Revelation. For him, the deposit of faith left us by Christ is of overwhelming importance. This deposit must be preserved and defended. Hence, a proper conservatism is an essential characteristic of the theologian.

[18] A. Miller, Das neue biblische Handbuch, *Benediktinische Monatschrift*, Vol. XXXI (1955), pp. 49-50; A. Kleinhans, De nova Enchiridii Biblici editione, *Antonianum*, Vol. XXX (1955), pp. 63-5.

[19] Henry, A. M. (Ed.). 1955. God and His Creation. Vol. II of Theology Library. Chicago, Fides. Cf. particularly Chapter VII, The Octave of Creation.

[20] I am here relying heavily on one of the best of the shorter pieces ever written on our problem: de Solages, Bruno. 1951. Christianity and Evolution. *Cross Currents*, No. 4, Summer. Pp. 26-37.

By way of contrast to that last paragraph, let us consider the position of the theologians in the 1860s. First of all, the doctrine of evolution was a new thing, and had to be considered carefully in its relation with dogma and the traditional interpretation of various parts of Scripture. Secondly, so many of the protagonists of evolution were also missionaries of what amounted to materialism (e.g., Huxley and Haeckel). It is scarcely to be expected that theologians would embrace materialism, which is the negation of the spirit and of religion. It is easy to see how emotions on both sides could obscure the truth, and particularly how difficult it would be for the theologians to keep the proper distinctions clear in the minds of the great mass of Catholics. Remember, we said before that the Church has not only an intellectual but a moral duty, in its care for all the faithful, lettered and unlettered. Another complication also arose: social doctrines, imitating biological evolutionary theory (e.g., "the law of Nature, red in tooth and claw"), became popular, and further confused the picture. It is easy enough for us, at times, to look back and see what should have been said and done during the battle, now that so much of the dust and smoke have settled. But let us remember that we, of this generation, have unsolved problems, too.

Let us now briefly present more accurate documentation for our preliminary statement, by passing in review the sources available to the theologian, on the three topics of (a) the evolution of Man's body in general; (b) the soul; and (c) Adam and Eve.[21]

(*a*) There is no defined doctrine which opposes a theory of the evolution of Man's body, and no definitions or other important pronouncements of the Church on this subject, with the exception of the three we shall mention. Up to 1909, there were two "private acts" of the Roman authorities, namely the request made of Fr. Leroy to revoke his public approval of

[21] For lack of space, I am not dealing with one of the sources appropriate to theology, namely the Fathers of the Church. These early witnesses to the universal teaching of the Church have been interestingly studied (with reference to our problem) in: Messenger, Ernest C. 1932. Evolution and Theology. New York, Macmillan.

evolution (1895), and the action of the Holy Office in ordering Fr. Zahm to remove his book, "Dogma and Evolution", from the market (1899). These acts were executive decisions made in the ordinary course of running the Church, and do not have any doctrinal significance. As noted, nothing like this has happened since 1909, although a fair number of Catholic authors have expressed favorable opinions about evolution (e.g., Dorlodot, Rűschkamp, Perier, O'Brien, Murray).[22]

The decree of the Biblical Commission, discussed a few pages back, did not exactly speak of the theory of evolution in general. However, its mention of "the special creation of man", Eve, etc., is intervowen into the theological thinking of our preliminary statement, including the statement that the creation of man involves a direct action by God on matter and soul.

In 1941, addressing the members of the Pontifical Academy of Sciences, our present Pontiff mentioned the fact that the various biological sciences had not as yet come up with positively clear and certain answers to various questions concerning the origin of Man. However, (foreshadowing his statement in the next document to be analyzed), he leaves it to the science of the future to work out certain answers in an area so important.

The latest, and most important document regarding this question is the Encyclical of Pius XII, *"Humani Generis."* We have already emphasized the fact that an Encyclical is the most important form of the ordinary teaching power and action (Magisterium) of the Church. We shall see how much of our preliminary statement is derived from this Encyclical.

"Humani Generis", published in 1950, was aimed at pointing out various current errors in philosophy and theology which were dangerous. Thus, mention is made in an early section of materialistic evolution. The other errors are not pertinent to

[22] Dorlodot, H. de. 1922. Darwinism and Catholic Thought. New York, Benziger; Rűschkamp, Felix. Der Mensch als Glied der Schöpfung. *Stimmen der Zeit*, Vol. 135 (1939), pp. 367-85. id. 1949. Zur Artgeschichte des Menschen. Baden-Baden, Drei-Kreise-Verlag Fritz Knapp; Perier, P.-M. 1937. Le Transformisme. Paris, Beauchesne. O'Brien, John A. 1932. Evolution and Religion. New York, Century. The book of Father Murray has been cited previously.

our present discussion, although the Pope's insistence on the importance of the *living* Magisterium is extremely significant for all intellectual Catholics.

In the section specifically dealing with the evolution of Man's body, Pope Pius XII (the full text is in the footnote[23]) makes the following pronouncements: (1) In our discussion concerning evolution, the fact of the spiritual soul is taken for granted by Catholics. (2) Otherwise, these discussions are left completely free by the Church. (3) However, these dicussions are for experts, and should be conducted as such, with reasons pro and con being weighed with scientific maturity, and all discussants ready to submit to the decision of the Church (they would not be Catholics if they were unready so to submit). (4) People should not act as if evolution were one hundred percent proved (as from the evidence available in 1950, at any rate), and as if there were no further problems involved in synthesizing "science" and Catholic belief.

(*b*)[24] The dogmatic background for the human soul is quite other than for the question of the evolution of the body. Back

[23] This and a subsequent quotation is taken from the translation in: Cotter, A. C. 1951. The Encyclical "Humani Generis" with a commentary. Weston, Weston College Press. (Pages 41 and 43). "Accordingly, the Magisterium of the Church does not forbid that the theory of evolution concerning the origin of the human body as coming from pre-existing and living matter—for Catholic faith obliges us to hold that the human soul is immediately created by God—be investigated and discussed by experts as far as the present state of human sciences and sacred theology allows. However, this must be done so that reasons for both sides, that is, those favorable and those unfavorable to evolution, be weighed and judged with the necessary gravity, moderation and discretion; and let all be prepared to submit to the judgment of the Church to whom Christ has given the mission of interpreting authentically the Sacred Scriptures and of safeguarding the dogmas of faith. On the other hand, those go too far and transgress this liberty of discussion who act as if the origin of the human body from pre-existing and living matter were already fully demonstrated by the facts discovered up to now and by reasoning on them, and as if there were nothing in the sources of divine revelation which demanded the greatest reserve and caution in this controversy."

[24] Cf. Chapter VI, Is There a Soul?, in God, Man and the Universe, cited previously.

in 1312, the Council of Vienna, whose decrees were approved by Pope Clement V, defined the doctrine that the intellectual and rational soul was the form of the human body. The word "form" is here used technically, to mean a substantial entity, infused into the body, and making the resulting composite one human being. The Council of the Lateran, in 1513, approved by Leo X, repeated this definition, and added the statement that each human soul was immortal, and decried the doctrine that all humanity had one soul.

In 1887, the Holy Office condemned a number of opinions taken from the writings of Rosmini-Serbati. Among them was one that held that the spiritual soul could have been evolved from an animal vital principle. The decrees of the Holy Office, when approved by the Pope (as these were) are like the decrees of the Biblical Commission, and command the assent of Catholics.

Returning to *Humani Generis*, we note that Pius XII places the doctrine that God immediately creates each human soul among those that Catholic faith teaches. This doctrine has never been formally defined, but belongs to that group of doctrines which Catholics believe, and to deny which would be heresy.

(*c*) Although the exact doctrine that Adam and Eve were the first parents of all men since their time has never been defined, still one is struck by the fact that all the ecclesiastical documents concerning them take this for granted. The Council of Carthage in 418; the Council of Orange in 529; and the Council of Trent in 1546—to mention outstanding and ecumenical examples, all speak of original sin, and in this connection of *one* Adam. The Biblical Commission, in 1909, mentions "the unity of the human race" as one of the fundamental doctrines reported in Genesis. All the Scriptural references dealing with our first parents plainly take it for granted that there was one man and one woman.[25]

[25] Genesis, 1:26; 2:5; 2:20; 3:20; Wisdom, 10:1; Acts, 17:26; 1st Corinthians, 15:45; and (indirectly) Romans, 5:12.

Pius XII, however, does not so much lean on the Scriptures in drawing up his condemnation of polygenism. He emphasizes the evident irreconciliability of Catholic doctrine concerning original sin with polygenism.[26]

The possibility that there were true men before Adam and Eve, men whose line became extinct (in other words, Preadamites), is allowable. But the Pope does not mention them. In view of the fact that we have no evidence at all concerning their existence, we shall not mention them, either.

It would make an already overburdened article entirely too long, for us to investigate here the Church's teaching concerning original sin, the Redemption by Christ and the redeeming function of the Church as the mystical continuation of Christ. Suffice it to say that these doctrines are absolutely basic to Christianity. We are not, then, dealing with unimportant factors in our concept of Man, and his relations with God.

Concluding Remarks

That last paragraph leads me to several brief concluding ideas.

The Church has the right and the duty of teaching and defending religious truth. This means it has the right to pronounce on anything that has any relationship with this truth. It does not invade the field of science, strictly speaking; thus the Church would not dare to proclaim a certain scientific theory true. But when the theories of scientists enter the realm of the theological, the Church has the right to oppose those theories which are theologically false.

[26] Humani Generis, Cotter, p. 43. "But as regards another conjecture, namely so-called polygenism, the children of the Church by no means enjoy the same liberty. No Catholic can hold that after Adam there existed on this earth true men who did not take their origin through natural generation from him as from the first parent of all, or that Adam is merely a symbol for a number of first parents. For it is unintelligible how such an opinion can be squared with what the sources of revealed truth and the documents of the Magisterium of the Church teach on original sin, which proceeds from sin actually committed by an individual Adam, and which, passed on to all by way of generation, is in everyone as his own."

Basically, the attitude of the Church, often proclaimed, is that there are two sources of knowledge of truth, Revelation and human reason. Contradictory statements flowing from these two sources cannot both be true; because all truth is of God, and God cannot contradict Himself. If there seems to be a conflict between two truths, then either human reason has gone astray, or perhaps Catholic doctrine is not properly understood by the combatants, or there is no real conflict at all.

Another fundamental thought, which has implications for our whole intellectual lives is: there are three levels of knowledge, the scientific, the philosophical, and the theological.[27] A conflict may develop when people are operating on two different levels, and are not aware of this. Thus, to take an example from cultural anthropology, the ethical relativist proposes the fact that what is considered wrong in one culture is considered right in another. Therefore, he says, there are no such things as absolute norms of morality. With the word "therefore", he is moving to the philosophical level. The method of philosophy is analytical, and not inductive alone. The absolute norms of morality are independent of the subjective ideas of this or that person or people. Catholic philosophers would, therefore, be objecting not to the scientific findings of ethnology, but to the philosophical thinking of the ethical relativists.

I have not had space to discuss the philosophy of evolution. This would entail many interesting discussions about just how can you tell when true Man has arrived on the scene, the limits of animal intelligence and the functions of the spiritual soul, the causality of evolution, and many others.

I am sure that there are many new theological angles, too, that my readers would like appraised, as well as clarifications they may need of statements here proposed. I therefore suggest that those interested write in their suggestions, questions, and problems to the Editor. At some later date, we could seek the hospitality of this journal with an article inspired by its readers and tailored to their specific needs.

[27] See the splendid article of Achille Cardinal Liénart, published in two sections, under the title "Science and the Bible", in *Commonweal*, June 17 and 24, 1949, pp. 241-243, 265-267.